Guest Editorial Preface

Special Issue on Education

Aleš Bourek, Masaryk University, Czech Republic

There is a saying that all good things come in threes (omne bonum trium). So three questions with suggested answers follow:

1. Why education? Because it is impossible to enforce reliability and accountability only using control mechanisms. All healthcare systems attempting safe and quality service provision based solely on the use of performance measurement, indicators, accreditation, standards and guidelines soon find themselves (realizing or not realizing it) in a situation described in the book The Collapse of Complex Societies (Tainter, 1988). Such systems finally end up consuming more resources than they generate which leads to their collapse.
2. Why change existing educational patterns? Because of the paradigm change affecting our profession. For several thousand years healthcare was empirical based, last three to four decades we request medicine based on evidence (with only vague understanding of the majority of involved stakeholders in healthcare what "evidence-based" really implicates). The paradigm shift lies in acceptance and use of hypothetically deductive thinking instead of the previously used inductive. Also the shift from using "real" tools for our work (the istrumentarium of doctors only gradually developed over time and with minor changes – a scalpel is still but a knife) to digital tools (majority of today's devices used in the process of healthcare provision ranging from digital thermometers to RF knives in electrosurgery and gamma-knives for neurosurgery) requires adjusting of the educational process because digital technologies develop in predictable (evolutionary) ways as well as in unexpected, discontinuous, emergent ways extremely rapidly.
3. Why this selection of authors? Because I know them as excellent and innovative educators truly influencing future generations of healthcare stakeholders. The five articles of this issue cover the role of physicians as educators rather than exclusively healers of disease and managers of patient complaints and address education of healthcare organizations managers in professional management as well as self-management in the area of well-being available also to non-professional course participants through complex e-learning approaches. Unsatisfactory level of competence in effective and safe use of medical devices among practicing healthcare professionals is also discussed and issues like supervision of practitioners-trainers who are themselves not sufficiently competent are voiced. Health service consumer education is presented in the article about a web portal aiming to show what the biggest gaps in access to health

services are - identifying in a dynamic way the patient and health care system needs and engaging consumers in health care systems improvement. The last article is about understanding that a culture of blame affects patient safety in healthcare systems and about the need to educate governments, the professions, healthcare administrators, industry and consumers at local and state levels.

If you feel we need to search for solutions, if you find healthcare education an important issue full of surprises, challenges, opportunities and controversies, then please accept the invitation to read the articles in this issue for inspiration provided by several of my close friends and collaborators.

The *International Journal of Reliable and Quality E-Healthcare* addresses a variety of issues that relate to the quality and reliability assurance of e-healthcare, patient safety, patient empowerment, and e-medicine and encourages international debate on the theoretical and practical aspects of these issues and e-health interaction. On the most generic level all above issues are intimately tied to the concept of accountability. To trust, rely on someone or to expect a quality service we are addressing either the individual or institutional accountability, unless we decide to rely on blind trust which may not be the best choice. There are several dimensions of "trust." In a social context one party (trustor) is willing to rely on the actions of another party (trustee); the situation is directed to the future. In addition, the trustor (voluntarily or forcedly) abandons control over the actions performed by the trustee. As a consequence, the trustor is uncertain about the outcome of the other's actions; he can only develop and evaluate expectations. The uncertainty involves the risk of harm to the trustor if the trustee will not behave as desired. In psychology, trust is believing that the trusted person will do what is expected. In philosophy trust is sometimes seen as more than a relationship of reliance (we can rely on our clock to give the time, but we do not feel betrayed when it breaks). Trust in economics is treated as an explanation for a difference between actual human behavior and the one that can be explained by the individual desire to maximize one's utility (Wikipedia, n.d.).

The importance of adequate level of trust surfaces with growing complexity of social structures where it provides a certain backbone for collaboration. Bearing in mind that healthcare is typically considered a science, a skill and a service (Bourek, 2011) where the involved professionals are expected to perform to a high degree of reliability, quality and at the same time minimize the risks (perform this service in as safe as possible way) it may come as a surprise, that only in the last three decades the practicing professionals are required to provide proof or evidence that they perform as expected (Kazandjian, 2002). This ever growing request was set off by a series of events eventually leading to the loss of blind trust in the behavior and outcomes produced by the medical professionals themselves (Kohn & Donaldson, 1999). The reason for addressing the situation in this journal is the profound effect of the dawn of Information Society (term that humankind currently officially uses to describe itself) some 20 to 30 years ago when the then existing Industrial Society renamed itself. The name-change happened, when in some parts of the world, more than half of the GNP started to be produced and more than half of the employees were active in the information economy (where majority of employees work in information jobs, they have to deal more with information, signals, symbols, and images than with energy and matter), when wealth was generated more by information processing than by Watts and kilowatts of engine power. The society always renames itself based on what produces the "wealth." New concepts of information management laid in 1930s (cybernetics, informatics) and new families of tools ICT (information and communication technologies, often referred to as computers) provided more efficient ways of storing, retrieving, sharing and processing - almost exclusively - digital data. Exact ways of data handling demonstrate over and over the limitations and risks (low quality and high

level of errors or un-safety) of practically all assessed healthcare systems. This "provided evidence" led to the loss of blind trust in health-care professionals we witness today. Loosing trust is a simple and straightforward process. Regaining trust by demonstrating a high level of accountability and reliability takes much longer. Over the years I've had the pleasure and the privilege to discuss possible ways to provide safer and better health care with all the authors of this special issue and also to work for over two decades with the national and international programs and institutions identifying opportunities and possibilities of healthcare quality improvement. Healthcare service as practiced in the 21st century relies mostly on the orchestrated efforts of many stakeholders (the patients and their families themselves, medical, managerial, technical and policy making professionals). All involved are expected to provide evidence of the level of their reliability, responsibility, efficiency, proficiency and accountability. In geographical areas where this is not required, several options exist. Healthcare systems have no information (thus function as uninformed) or live in the illusion of performing well - they lie to themselves, live in illusion, or they have bad information (and then behave and perform as misinformed). Wrong or no information processing ultimately (with the exception of rare occasions) leads to wrong decisions and sub optimal results.

There is only one way to regain trust-credibility-accountability, transparent provision of accounts enabling judgment (methodology is well documented in the Bible, Koran and many other scriptures). There may well be two ways of trust building, of improving one's account-ability. One path is the path of measurement and provision of evidence (gathering all valid accounts for all relevant facts and interpreting them properly - providing the right mirror/reflection that allows us to see otherwise unobvious errors). The second and complementary path is by acquisition and development of right habits, behaviors and attitudes. Measurement, especially measurement of complex systems is an extremely intricate and sophisticated process. Anyone who has been exposed to the task of collecting timely, relevant and undistorted (un-gamed, reliable) healthcare data in order to construct, verify and provide indicators useful for appropriate interpretation and finally aiding in making the right decisions and monitoring and evaluating the effect of the actions based on such data handling intimately knows all the dark allies and gray areas one gets exposed to, and the possibilities, limitations and risks of this approach. Such people are also aware of the organizational and financial burdens related to the described process. The so-called developed healthcare systems often invest vast amounts of energy and resources into maintaining a variety of monitoring, evaluation and control systems. Their complexity exponentially grows with the amount of digitally coded health and healthcare related data. There are certainly limits we have to consider when we embark on the "measurement" path. When the amount of energy and resources invested surpasses the benefit derived from the effort, we witness systems collapses.

This journal issue focuses more on a second pathway. On education as a method of helping the existing and will be healthcare professional to acquire the set of right habits, behaviors and attitudes in order to liberate future healthcare systems from the necessity of development and implementation of overblown monitoring and controlling mechanisms (that are of course absolutely necessary when a collaborative effort of irresponsible and unreliable individuals is expected to produce consistently a high quality and high safety service). Healthcare professionals are required to undergo formal education and training. The reason being, that many (if not all in the broadest sense) processes essential for the provision of healthcare services require the use of "managed violence" (essentially the only difference between a murderer and a surgeon is the fact that the later uses the same instrument in a managed way). Demonstration of the capability of being able to "manage" is required in the medical profession since medieval times (usually it is called a diploma and medicine was the first secular profession requiring such proof of accountability). One may question

why, when such a tradition in medical education exists, we have decided to revisit the issue and reflect on it. For over two and a half thousand years medical education evolved and until quite recently the used educational process seemed to be capable of producing responsible and well performing professionals. Of course in the intention of what has been voiced above, possibly we may have been living in illusion. Partly the impossibility of retaining existing educational process in healthcare is based on the fact that for generations used empirical medical approaches have been submitted to necessary critical analysis and together with our current understanding of "evidence" the inductive way of thinking (well rooted in the profession and fostered by still not surpassed educational approaches) is only very gradually giving way to the hypothetical deductive way of handling medical knowledge which forms the core of EBM practice. Still many professionals have no intrinsic understanding of the profound change the introduction of this term has on the way how today's healthcare professional is expected to handle information, learn, think and perform.

Probably the weirdest shift that we have to do when it comes to education of the medical professionals is the necessity to teach useful habits and attitudes for forthcoming healthcare environments at a time when we have no idea about how they will really look and function. There are also other issues why existing educational activities under-perform. One reason is the heterogeneous level of information and communication literacy of the trainees and usually no or only limited proficiency in information management (informatics and cybernetics) traditionally considered as areas of marginal interest for the medical professional. All of this at a time when "advanced" healthcare systems spend 30% of their budget on digital technologies and healthcare informatics. The second issue is the fast and sometimes unpredictable progress in any given scientific domain. Third reason is that efficient teaching requires the mentor to be competent, capable of lifelong learning, constantly monitor emerging trends and directions in the area of information technologies but on the other hand also to be extremely conservative and cautious in applying these novelties in the treatment process itself until thorough research is finished and "evidence" produced. To teach for the future we must teach intelligently, to achieve this, we need to remodel existing medical curricula (and possibly the curricula of all non-medical professionals participating in the healthcare system and also the education of patients and their families). Schlesinger and Hlavach wrote on the issue of intelligence "You and we altogether should not see such a great nonsense in that one can learn about something, which has never been observed. The entire intellectual activity of individuals, as well as that of large human communities, has for long been turned to those parameters which are inaccessible to safe observation." Recall astronomers predicting an unobserved planet by encountering discrepancies in observations from assumed elliptical orbits of observable planets since Kepler laws have been known. Such an approach is a normal procedure for analyzing unknown phenomena. The capability of doing such explorations has since long ago been considered to be a measure of intelligence" (Schlesinger & Hlavach, 2002).

Intelligence may be looked upon as a synergetic combination of:

1. Activity for external interaction. This characteristic is basic for all open systems. Activity for external interaction means the possibility to reflect the inputs from environment and to effect impact on the environment. For instance, in Walter Fritz' definition (Fritz, 1997) these are "senses" and "actuators"; information reflection and information memory, i.e., possibility for collecting the information. It is clear; memory is a basic characteristic of intelligence for the ability to learn";
2. Information self-reflection, i.e., possibility for generating "secondary information." The generalization (creating abstractions) is a well known characteristic of intelligence. To reach ones objective we choose actions

based on experiences. We can learn by generalizing the stored experiences.

3. Information expectation, i.e., the (secondary) information activity for internal or external contact. This characteristic means that prognostic knowledge needs to be generated in advance and during the interaction with the environment when the received information is collected and compared with one generated in advance. This is not noted in usual definitions but it is the corner-stone for defining the concept of "intelligence";
4. Resolving the information expectation. This corresponds to that the "intelligence is the ability to reach ones objectives". The target is a model of a future state (of the system) which needs to be achieved and corresponding to it prognostic knowledge needs to be "resolved" by incoming information.

In summary, the intelligence is creating and resolving the information expectation (Mitov et al., 2010) and Theory of Infos (Markov et al., 2009).

Effective ways of education need to be identified, tested and used. Computer-assisted learning (a MeSH term) or web-enhanced education are examples of available approaches. But when it comes to medical education possible options usually limit themselves to multimedia atlases, teaching archives of digital images, interactive educational webs and portals, multimedia electronic textbooks and e-learning interactive courses. From my point of view two most important advantages of the virtual learning environment – collaborative/competitive games with fun elements and computer-aided simulations are definitely underused in health related education. The shift we need to make is from lecture-based to computer assisted teaching and learning incorporating principles of computer-assisted instruction (CAI) and computer managed instruction (CMI). We will also need to proceed from retrospective learning methodologies to a prospective way of learning. The digital environment needs to support student to student and student to faculty interaction and obviously is most useful in situations requiring the handling of explicit information and at least for the time being useless in areas where implicit information is of importance (Bourek, 2011). As much as the delivery format is important it must be said, that it is not the format itself which enhances learning, but mainly the content and the choice of the appropriate topics.

Understanding these principles and having access to the today's existing ICT infrastructure (as intangible as the emerging and ambient "cloud computing" environment may be) gives us the possibilities of creating and using Virtual Laboratories for computer aided health and healthcare education, potentially incredible tools enhancing our possibilities in the area of proper training of health-intelligence. Quality assurance depends on quality education and formation of the necessary habits of the future professional generation and is not achieved just by training through repetitive actions and drill (where the traditional training environment is sufficient), but by facilitating achievement of competence without compromising the emergence, spontaneity and creativity of the teacher and learner (colleagues in education) in the context of the e-environment (where the available but under-used virtual training will play a crucial role). If well understood and used, this approach may provide us with the opportunity to maximize the existing "genotypic" possibilities of each individual healthcare stakeholder by "turning on" the right genes (in the same sense as we see in epigenetics - the study of heritable changes in gene expression caused by mechanisms other than changes in the underlying DNA sequence) and facilitating quick expression of the right phenotype of the intelligent healthcare service provider and also of the service consumer.

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Aleš Bourek, MD, PhD, heads the Center for Healthcare Quality, Masaryk University, Faculty of Medicine (www.med.muni.cz/cekz), is a senior lecturer in health informatics and an active gynecologist/embryologist in his Laboratory of assisted reproductive techniques (L'ART) facility. He worked as advisor for DG SANCO, WHO, World Bank, and is a CEESTAHC (Central and Eastern European Society for Technology Assessment in Health Care), and ESQH (European Society for Quality in Health Care) board member. He published and lectured on healthcare quality and health informatics and is on the editorial board of several journals. Constantly looking at innovative data, information, knowledge, concepts management opportunities. Loves to think, reflect, and spend time with family and friends. Enjoys skiing, hiking in extreme locations, meeting and hosting people abroad and at home. His general attitude is "I am not a complete idiot - I am aware that some parts are still missing".